Powered by Microsoft® Windows® CE


SOLO

# MONITOR

## Laser Power / Energy Meter

CE

- Single Channel
- Microsoft Windows CE™
- User-Friendly
- Large Display
- Full Statistical Functions
- Power/Energy/Photo Detectors
- USB / RS-232



## SOLO

Gentec Electro-Optics SOLO is the newest, most advanced, microprocessor-based power and energy meter in the Gentec-EO arsenal. It is the ideal choice for applications that only need to read one detector at a time. We have added more capability and at the same time made our friendly interface even more user friendly. The SOLO gives you complete statistics and allows you to save data internally and to your PC.

## Windows CE™

SOLO's menu-driven Windows CE™ based interface is easy and intuitive enough to master in minutes. You can also download the operating software for the SOLO from our website. Our newest features, latest improvements, and even custom modifications just for you, are available at the click of a button.

## Power and Energy

The SOLO PE gives you the flexibility to read both power and energy detectors as simply as plugging in a new head. The SOLO lets you display power from a photodiode detector in dBm or watts. The SOLO will recognize the detector and automatically download all the calibration information it needs from the detector's EEPROM.

## OEM Version

SOLO X is our PC-based version of the SOLO PE, without keyboard or display. It is ideal for networked OEM installations. It is great where you have a high degree of automation or need to keep people away from the process.

## Large Display

Your eyes will appreciate the easy to view high resolution 58x38 mm graphic LCD display of the SOLO PE. Your computer screen is the display for the SOLO X.

## Ergonomic Design

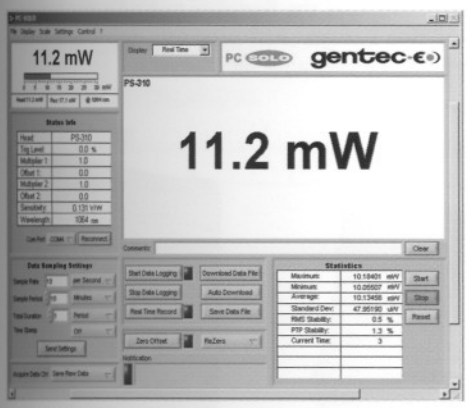
Compact, sturdy, and easy to handle, the SOLO can go anywhere! You will appreciate its ergonomic shape and adjustable stand. The stand protects the SOLO when you travel and it is adjustable so you can avoid the glare from overhead lights.

## Data Acquisition

Data acquisition and remote control are possible via serial RS-232 and USB ports for the SOLO PE, and via USB port for the SOLO X. Your can use an adapter to plug the SOLO into your GPIB system and have the same functionality. You can save your settings so the SOLO PE will be ready to go as soon as you power it up. You can turn on the time stamp to ease your analysis or leave it off to maximize your storage. Data is easily plotted on widely available spreadsheets and plotting programs.

## Remote Control

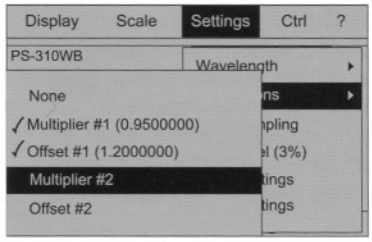
PC-SOLO, a user-friendly communication software package, lets you control the SOLO PE and X from your PC. It is particularly useful for data acquisition since the storage capacity is determined by your PC's hard disk. It is the only interface for the SOLO X. Upgrades for PC-SOLO are available on our website. You'll find our LabVIEW drivers there as well. Use them as is, or customize them for your specific needs.



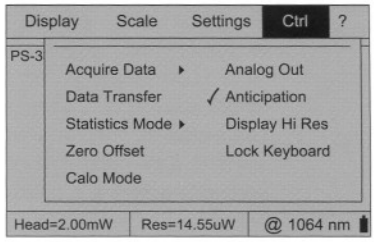

PC-SOLO Software


1 0 to 1 volt analog output
2 Detector
3 RS-232 connector
4 External power supply input
5 Mini USB connector

## CONVENIENT WINDOWS CE™ MENUS

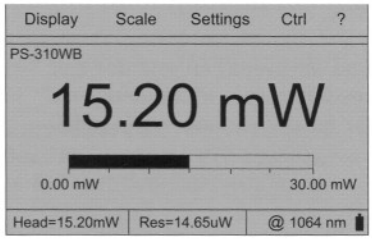



SOLO's menu-driven Windows CE™ based interface is easy and intuitive enough to master in minutes.



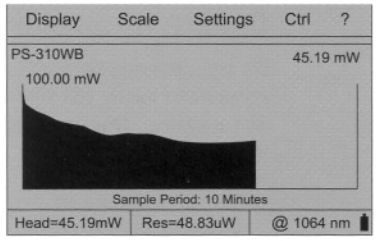

A multitude of easy window based controls for every application.

## REAL TIME DISPLAY



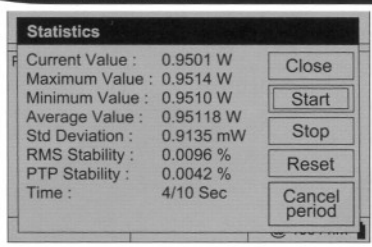

High or Low Resolution. Select the high resolution mode for the most significant digits available or the standard resolution to filter out unimportant fluctuations in the measurement.

## HISTOGRAM DISPLAY



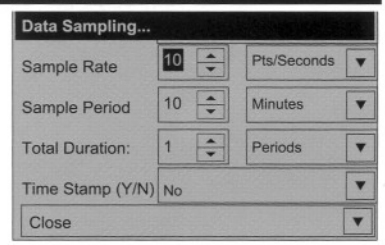

Easily switch between Real time, Line plot, Histogram, Digital needle and Statistics displays.

## STATISTICS DISPLAY



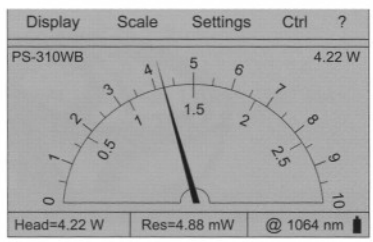

The SOLO can display a complete statistical analysis of power or energy measurements.

## DATA SAMPLING SETUP



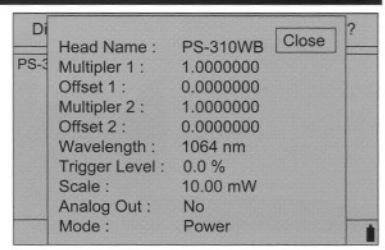

You have complete control over the data sampling. Use the defaults or select your own sample rate, sample period, and the time period or number of points to do the statistics.

## TUNING DISPLAY




The SOLO also provides a fast, high resolution digital needle suitable for tuning and aligning. Refresh rate: 15Hz.

## STATUS SCREEN




Look at the Status screen to review all of your settings at any time.

## Automatic Head Recognition

The SOLO works with all Gentec-EO detectors. It automatically recognizes every detector head, ensuring accurate auto-calibration. More importantly, it can take advantage of our *Personal wavelength correction*™. It reads the memory in the Smart Interface connector to provide a wavelength correction that is based on spectral data measured from that specific detector. Your measurements across the band have never been this precise or easy.

## Fast Response

The SOLO can handle data from energy detectors up to 1 kHz. It also features an anticipation circuit for fast power detector response.

## Quality Thresholds

We even provide threshold lines you can overlay on your line plot so you can easily tell when the measurement is within or outside of tolerance. This is excellent for quality control and pass/fail monitoring applications.

## Correction Factors

If you use a sampling device such as the Gentec-EO Holographic Beam Sampler (HBS) or need to account for other optics in your system you can easily program correction factors to obtain a true value reading. The SOLO allows you to enter two multipliers and 2 offsets for maximum measurement flexibility.

## Saves Data and Settings

The SOLO can store data in flash memory and transfer it to a PC. The SOLO can also remember and recall your settings. Look at the Status screen to review all of your settings at any time.

## Flexible Power

Use the battery in the field. Recharge and take data at the same time with the external power supply. In addition, operate the SOLO without battery or power supply when plugged into a USB port! This is great for changing batteries without interrupting your measurements.

## Flexible Statistics

You can set the SOLO to calculate the statistics for a single sample and stop, or to repeat continuously. Take data for a few seconds or a few weeks. You have the flexibility to handle any application from analyzing a single short pulse with high resolution to sampling performance over a period of months.

SOLO ADJUSTABLE STAND

PROTECTIVE COVER

OPTIONAL PROTECTIVE POUCH

SOLO X

OPTIONAL WALL BRACKET

INCLUDED USB CABLE

OPTIONAL RS-232 CABLE

BATTERY PACK

# SOLO SPECIFICATIONS



| | SOLO PE | SOLO X |
|---|---|---|
| **POWER METER SPECIFICATIONS** | | |
| Power Range (thermal head) | 100 µW to 10 kW | ✓ |
| Power Range (photo detector head) | 1 pW to 3 W | ✓ |
| Resolution (digital) | 15 µW on the 30 mW scale | ✓ |
| Monitor Accuracy | ± 1.0%[a] | ✓ |
| Thermopile Response Time (accelerated) | 1 sec | ✓ |
| Statistics | Current value, Max, Min, Average, Std Dev., RMS stability, PTP stability, Time | ✓ |
| **ENERGY METER SPECIFICATIONS** | | |
| Energy Range | 8 µJ to 20 kJ | ✓ |
| Resolution (digital) | 50 nJ | ✓ |
| Monitor Accuracy | 1.0%[a] | ✓ |
| Software Trigger Level | 0.1 to 99.9%, 0.1% resolution, default 2%[a] | ✓ |
| Repetition Rate | 1000 Hz | ✓ |
| Statistics | Current value, Max, Min, Average, Std Dev., RMS stability, PTP stability, Pulse #, Repetition Rate, Avg Power | ✓ |
| **DETECTOR COMPATIBILITY** | | |
| Thermopile (power detector) | Average Power | ✓ |
| | Single Shot Energy | ✓ |
| Pyroelectric (energy detector) | Pulse Energy including single shot | ✓ |
| Photo Detector | Average Power (mW, dBm) | ✓ |
| **GENERAL SPECIFICATIONS** | | |
| Digital Display | 58 x 38 mm LCD, 160 x 240 pixels | PC screen |
| Data Storage | up to 225 000 points[b] | ✓ |
| Data Displays | Real time, Line plot, Histogram, Statistics, Tuning display | ✓ |
| High Resolution mode | More Significant Digits | ✓ |
| User input correction factors | 2 Multipliers and 2 Offsets (7 digits) | ✓ |
| Analog Output | 0-1 volt, full scale, ±1% | ✓ |
| Internet upgrades | USB and RS-232[c] (up to 115.2 kbps) | USB |
| PC SOLO | ✓ | ✓ |
| PC Serial Commands | USB and RS-232[c] | USB |
| LabVIEW Drivers | ✓ | ✓ |
| Dimensions (without stand) | 230 (L) x 95 max (W) x 55 max (H) mm | 231 x 102 x 35 mm |
| Weight | 0.58 kg (with stand) | 0.44 kg |
| Battery pack | 4 rechargeable 1.2 V Ni-MH AA (6 hours to full charge) | --- |
| External Power Supply | 220/240 VAC, 50 Hz to 12 VDC, 1A;<br>100/120 VAC, 60 Hz to 12 VDC, 800 mA;<br>or USB | ---<br>---<br>USB |

| Order number | Description | Order number | Description |
|---|---|---|---|
| 100-200076 | SOLO PE + Battery + Power Supply + USB Cable | **100-200128** | Optional SOLO Protective Pouch |
| 100-200293 | SOLO X + USB Cable | **100-100283** | Optional SOLO Wall Bracket |
| 100-200106 | Optional SOLO RS-232 Cable | **100-200083** | Spare SOLO Battery Pack |

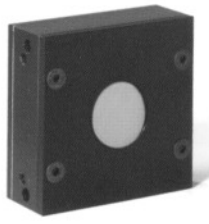
a. For Rep. Rate < 500 Hz.

b. Maximum when not using advanced features that require memory.

c. USB Cable is included with the SOLO, RS 232 cable must be purchased separately.

Specifications subject to change without notice.


UP19K-30H-H5



UP19K-15S-H5

# POWER DETECTORS

## Mid Power – Compact

CE

- **Fast**
- **Small Size**
- **Flat Spectral Response**
- **Full NIST-Traceability**
- **High Damage Threshold: 36 kW/cm²**
- **Personal Wavelength Correction™**

## Ultra Series UP19K-H5

Ultra Power and Ultra Performance are what you get with our new UP series detectors. Ultra performance means fast. These are the fastest detectors in the Gentec-EO arsenal. Ultra performance means compact. The UP series detectors can take a lot of laser power in a small body. Ultra performance means flexible. They come ready to mount on a rod, a bracket and the square case even lets you set them right on the table. Ultra performance means expandable. We can easily increase the power capability of your modular UP series detector as your needs change. Ultra performance means accurate. It is hard to do better than our NIST traceable calibration and *Personal wavelength correction™*. Ultra performance means versatile. Each model is compatible with all Gentec-EO monitors. A UP series detector is the best choice for many applications.

## Low Profile

The UP19K-15S-H5, just 21 mm thin, is ideal for laser maintenance and service applications. From a few mW to 15 W it is the smallest, toughest and fastest detector in its class. The absorber handles 36 kW/cm² of average power density. Only Gentec-EO's WB detectors can do better. It is fast with a response better than 0.6 seconds using a Gentec-EO monitor. You can even run it up to 23 watts for short periods. That's ultra performance and ultra value!

## Convection Cooled

These models use convection cooling to increase the power range of the UP19K family. The UP19K-30H-H5 takes you to 30 W continuous and 45 W intermittent. Using our oversized custom heatsink the UP19K-50L-H5 pushes that to 50 W continuous and 75 W intermittent.

## Air and Water Cooled

You want the same small package but for high average power. With a few volts to power the fan the UP19K-110F-H5 handles 110 W of laser power in an amazingly compact package. With water cooling, the UP19K-150W-H5 takes 150 watts. With the DI option it is perfect for clean deionized water cooling systems.

## Calorimeter Mode

With this option every member of the family can be equipped to measure single shot pulse energies as well as average power. From 20 mJ up to 5 J Q-switched or 25 J long pulse.

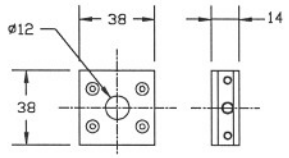
## Fiber Optic Option

Optional fiber adapters are available for these detectors.

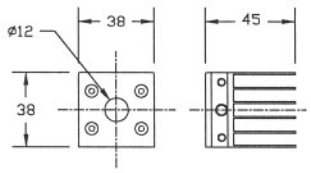
# ULTRA SERIES UP12E SPECIFICATIONS

| TYPICAL LASERS | COMMON APPLICATIONS |
|---|---|
| • $CO_2$ | • Low energy OEM |
| • YAG (various) | • High repetition rate |
| • Diode bars | • Photolithography |
| • Excimer | • Medical |
| • Ti:sapphire | |
| • Ruby (long pulse) | |

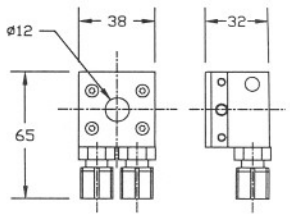
**10S**




**20H**




**70W**




All dimensions in mm

| | 10S | 20H | 70W |
|---|---|---|---|
| **MEASUREMENT CAPABILITY** | | | |
| **Spectral Range** | 0.19 – 11 µm | 0.19 – 11 µm | 0.19 – 11 µm |
| **Maximum Measurable Power** | 10 W | 20 W | 70 W |
| **Minimum Detectable Power**[a] | 1 mW | 1 mW | 1 mW |
| **Rise Time (nominal)**[b] | 0.3 sec | 0.3 sec | 0.3 sec |
| **Sensitivity**[c,d] | 0.6 mV/W | 0.6 mV/W | 0.6 mV/W |
| **Calibration Uncertainty**[e] | ±2.5 % | ±2.5 % | ±2.5 % |
| **Repeatability** | ±0.5 % | ±0.5 % | ±0.5 % |
| **Power Resolution** | ±0.5 % | ±0.5 % | ±0.5 % |
| **Calorimeter mode** | | | |
| Sensitivity | 0.95 mV/J | 0.95 mV/J | 0.95 mV/J |
| Maximum Measurable Energy[f] | 5 J | 5 J | 5 J |
| Minimum Measurable Energy | 0.2 J | 0.2 J | 0.2 J |
| Minimum Repetition Period | 1.5 sec | 1.5 sec | 1.5 sec |
| Maximum Pulse Width | 50 ms | 50 ms | 50 ms |
| Accuracy with energy calibration option | ±5 % | ±5 % | ±5 % |
| **Beam Size Dependence**[g] | ±0.5 % | ±0.5 % | ±0.5 % |
| **DAMAGE THRESHOLDS** | | | |
| **Max Average Power (continuous)** | 10 W | 20 W | 70 W[h] |
| **Max Average Power (2 minutes)** | 15 W | 30 W | 90 W |
| **Maximum Average Power Density**[i] | 36 kW/cm² | 36 kW/cm² | 36 kW/cm² |
| **Pulsed Laser Damage Thresholds** | | Max Energy Density | Peak Power Density |
| 1.064 µm, 360 µs, 5 Hz | | 5 J/cm² | 14 kW/cm² |
| 1.064 µm, 7 ns, 10 Hz | | 1 J/cm² | 143 MW/cm² |
| 532 nm, 7 ns, 10 Hz | | 0.6 J/cm² | 86 MW/cm² |
| 248 nm, 26 ns, 10 Hz | | 0.3 J/cm² | 43 MW/cm² |
| **PHYSICAL CHARACTERISTICS** | | | |
| **Effective Aperture Diameter** | 12 mm Ø | | |
| **Absorber** | High Damage Threshold – H5 | | |
| **Dimensions** | 38H x 38W x 14D mm | 38H x 38W x 45D mm | 38H x 38W x 32D mm |
| **Weight (head only)** | 0.13 kg | 0.15 kg | 0.19 kg |
| **Effective Area** | 1.13 cm² | 1.13 cm² | 1.13 cm² |

a. Nominal value, actual value depends on electrical noise in the measurement system.
b. With Gentec-EO TPM 300CE, DUO, SOLO or P-LINK monitor.
c. Maximum output voltage = sensitivity x maximum power.
d. Higher sensitivity with internal circuit. Contact Gentec-EO.
e. Including linearity with power. With Gentec-EO monitor.
f. For 360 µs pulses. Higher pulse energy possible when customized for long pulses (ms), less for short pulses (ns).
g. Beam centered.
h. Minimum cooling flow 0.5 liter/min, water temperature ≤ 22°C, 1/8 NPT compression fittings for 1/4 inch semi-rigid tube. Contact Gentec-EO for clean deionized water cooling module option.
i. At 1064 nm.

Specifications subject to change without notice.

gentec-eo

GENTEC ELECTRO-OPTICS INC.

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PH100-Si

# PHOTO DETECTORS

## Low Power

CE

- **Fast**
- **Small Size**
- **Si, Si-UV, Ge**
- **Full NIST-Traceability**
- **Smart Interface**

## PH Series Photo Detector Specifications

Gentec-EO offers a series of photo detectors that can extend your laser power measurement capability down to the picowatt range. We have a solution for your low power measurements for wavelengths from 200 nm to 1.8 micron. You have 3 models to choose from: silicon, UV-enhanced silicon and germanium. The silicon detectors provide a generous aperture for laser beams up to 10 mm in diameter. The threaded aperture allows you to install filters, attenuators, fiber optic adapters or other optics that suit your specific needs. All of the detectors have a NIST traceable calibration and *Personal wavelength correction™*. Our photo detectors are compatible with the Gentec-EO SOLO PE and P-Link monitors.

### Silicon

This is the choice for typical low power CW lasers from 300 to 1100 nm. Make measurements down to 600 pW and up to 0.75 W with an OD-2 attenuator.

### Silicon-UV

For low power CW lasers working at shorter wavelengths we offer this photo detector sensitive to 200 nm. Maximum power with OD-2 attenuator is 5.4 mW. Other performance characteristics are similar to the regular silicon detector.

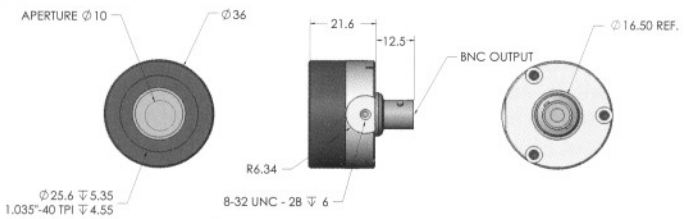
### Germanium

For longer wavelengths, our germanium photo detector is a nice solution between 0.8 and 1.8 microns for laser beams up to 9 mm in diameter. With the attenuator it will go to 0.75 W.

### Attenuators

To extend the performance of the photo detectors to higher measurable powers you can select one of our attenuators. The transmission of the OD-1 is 10% and the transmission of the OD-2 is 1%.

| Si | Si-UV | Ge |
|---|---|---|
| • HeNe<br>• Diode<br>• Argon Ion | • HeCd<br>• MicroYAG | • Diode<br>• Tunable color center<br>• Raman shifted YAG |
| • Wafer inspection<br>• Multimode fiber | • Data storage<br>• Bioluminescence | • Diode pumps for single mode fiber amps<br>• Telecom source testing |




All dimensions in mm

| | PH100-Si | PH100-Si$^{UV}$ | PH78-Ge |
|---|---|---|---|
| **MEASUREMENT CAPABILITY**[a] | | | |
| **Spectral range** | 300 -1100 nm | 200 -1100 nm | 800 -1800 nm |
| **Maximum Measurable Power (1064 nm)** | 30 mW | 54 µW | 27 mW |
| With OD-1 attenuator | 0.3 W | 0.54 mW | 0.27 W |
| With OD-2 attenuator | 0.75 W | 5.4 mW | 0.75 W |
| **Minimum Measurable Power**[b] | 600 pW (980 nm) | 600 pW (850 nm) | 20 nW (1550 nm) |
| With OD-1 attenuator | 6 nW | 6 nW | 200 nW |
| With OD-2 attenuator | 60 nW | 60 nW | 2 µW |
| **Rise Time (nominal)** | 0.2 sec | 0.2 sec | 0.2 sec |
| **Peak Sensitivity** | 0.5 A/W (980 nm) | 0.5 A/W (850 nm) | 0.9 A/W (1550 nm) |
| **Calibration Uncertainty** | ±6.5% 0.3-0.44 µm<br>±2.5% 0.44-1.0 µm<br>±3.5% 1.0-1.1µm | ±6.5% 0.2-0.44 µm<br>±2.5% 0.44-1.0 µm<br>±3.5% 1.0-1.1 µm | ±3% 0.8-1.8 µm |
| **Accuracy** (with OD-1 and OD-2 attenuators) | ±5% | ±5% | ±5% |
| **Wavelengths available (with SOLO PE and P-LINK)** | 325, 351, 440, 488, 514.5, 532, 632.8, 670, 694, 780, 850, 980, 1064 nm | 248, 266, 325, 351, 440, 488, 514.5, 532, 632.8, 670, 694, 780, 850, 980, 1064 nm | 850, 980, 1064, 1310, 1550, 1620 nm |
| With OD-1 attenuator | 440, 488, 514.5, 532, 632.8, 670, 694, 780, 850, 980, 1064 nm | 488, 514.5, 532, 632.8, 670, 694, 780, 850, 980, 1064 nm | 980, 1064, 1310, 1550, 1620 nm |
| With OD-2 attenuator | 632.8, 670, 694, 780, 850, 980, 1064 nm | 632.8, 670, 850, 980, 1064 nm | N/A |
| **DAMAGE THRESHOLDS** | | | |
| **Maximum Average Power Density (1064 nm)** | 100 W/cm² | 100 W/cm² | 100 W/cm² |
| **Saturation Level (1064 nm)** | 30 mW/cm² | 50 µW /cm² | < 100 mW/cm² |
| **PHYSICAL CHARACTERISTICS** | | | |
| **Effective aperture diameter** | 11.28 mm Ø | 11.28 mm Ø | 10 mm Ø |
| **Dimensions** | 36 mm Ø x 34.1 mm | 36 mm Ø x 34.1 mm | 36 mm Ø x 34.1 mm |
| **Weight** | 71 g | 71 g | 71 g |
| **Active area** | 1 cm² | 1 cm² | 0.78 cm² |

[a] With Gentec-EO SOLO PE and P-Link monitors.
[b] Half hour warm-up before offset nulling, offset nulling on the lowest scale after each new power supply. Temperature ±0.5 degrees.

Specifications subject to change without notice.